

Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of the claims in the application:

- 1 1. (Previously Presented) A method of detecting an incident along a roadway, comprising the  
2 unordered steps of:
  - 3 arranging a plurality of readers at intervals along a roadway for reading uniquely  
4 identified data from each one of a plurality of vehicles;  
5 correlating the data with previously read data to obtain information regarding each one of  
6 the plurality of vehicles;  
7 determining the number of vehicles potentially affected by the incident along the  
8 roadway; and  
9 comparing the number of vehicles potentially affected by the incident to a sample  
10 threshold.
- 1 2. (Original) The method of claim 1, wherein the plurality of readers comprises a plurality of  
2 traffic probe readers.
- 1 3. (Previously Presented) The method of claim 1, wherein each one of the plurality of readers is  
2 spaced at least five kilometers from an adjacent reader.
- 1 4. (Previously Presented) The method of claim 1, wherein the information regarding each one  
2 of the plurality of vehicles comprises at least one of:
  - 3 a vehicle speed;
  - 4 an expected vehicle travel time for a vehicle to travel between two adjacent readers; or
  - 5 an expected arrival time for a vehicle to arrive at one of the plurality of readers.
- 1 5. (Previously Presented) The method of claim 1, wherein the step of determining the number  
2 of vehicles potentially affected by the incident comprises the step of determining an expected

3 arrival time for each one of the plurality of vehicles to be detected by a particular one of the  
4 plurality of readers.

1 6. (Previously Presented) The method of claim 5, wherein the step of determining the number  
2 of vehicles potentially affected by the incident further comprises the steps of:

3 determining an amount of time each one of the plurality of vehicles is overdue past the  
4 expected arrival time; and

5 comparing the amount of time each one of the plurality of vehicles is overdue to a  
6 predetermined threshold.

1 7. (Original) The method of claim 6, wherein the predetermined threshold is adjusted according  
2 to the roadway usage.

1 8. (Previously Presented) The method of claim 5, wherein the step of determining the number  
2 of each one of the plurality of vehicles potentially affected by the incident further comprises the  
3 steps of:

4 determining an amount of time each one of the plurality of vehicles arrives earlier than  
5 the expected arrival time; and

6 comparing the amount of time each one of the plurality of vehicles arrives early to a  
7 predetermined threshold.

1 9. (Original) The method of claim 8, wherein the predetermined threshold is adjusted according  
2 to the roadway usage.

1 10. (Previously Presented) The method of claim 1, further comprising detecting an incident in  
2 response to the number of the vehicles potentially affected by the incident exceeding the sample  
3 threshold.

1 11. (Previously Presented) The method of claim 10, wherein some of the number of vehicles  
2 potentially affected by the incident are overdue at a particular one of the plurality of readers.

12. (Previously Presented) The method of claim 10, wherein some of the number of vehicles potentially affected by the incident arrive early at a particular one of the plurality of readers.

13. (Previously Presented) The method of claim 10, wherein the number of vehicles potentially affected by the incident is counted over a predetermined time interval.

14. (Previously Presented) The method of claim 4, wherein the expected arrival time is a function of a vehicle type.

15. (Previously Presented) The method of claim 1, wherein the plurality of readers comprise respective transponder readers.

16. (Previously Presented) The method of claim 1, wherein the plurality of readers comprise respective license plate readers.

17. (Previously Presented) The method of claim 1, wherein the determining the number of vehicles potentially affected by the incident comprises determining an instantaneous speed of some of the plurality of vehicles..

18. (Currently Amended) The method of claim 5, wherein the expected arrival time for each one of the plurality of vehicles is calculated by:

$$ExpSpeed[V_i, S_j] = \min(StartSpeed[V_i, S_j], HighSpeed[S_j])$$

$$ExpTime[V_i, S_j] = \frac{Length[S_j]}{ExpSpeed[V_i, S_j]}$$

where,

$V_i$  is a vehicle entering a roadway segment  $S_j$ ;

$ExpTime[V_i, S_j]$  = expected arrival time for the vehicle  $V_i$ ;

$StartSpeed[V_i, S_j]$  = starting speed of the vehicle  $V_i$  at the beginning of the roadway segment  $S_j$ ;

$ExpSpeed[V_i, S_j]$  = expected speed of the vehicle  $V_i$  over the roadway segment  $S_j$ ;

*HighSpeed* [ $S_j$ ] = average legal speed limit over the roadway segment  $S_j$ ; and

*Length* [ $S_j$ ] = length of the roadway segment  $S_j$ .

19. (Currently Amended) The method of claim 18, wherein an overdue time for each one of the plurality of vehicles, is calculated by:

$$\text{Overdue}[V_i, S_j, t_c] = \frac{t_c - \text{StartTime}[V_i, S_j] - \text{ExpTime}[V_i, S_j]}{\text{ExpTime}[V_i, S_j]} \times 100\%$$

where,

$\text{StartTime}[V_i, S_j]$  = time that the vehicle  $V_i$  entered the roadway segment  $S_j$ .

20. (Currently Amended) The method of claim 18, wherein a difference between the expected arrival time and an actual segment travel time for each one of the plurality of vehicles is calculated by:

$$\text{Diff}[V_i, S_j] = \frac{\max\left(\text{ActualTime}[V_i, S_j], \frac{\text{Length}[S_j]}{\text{HighSpeed}[S_j]}\right) - \text{ExpTime}[V_i, S_j]}{\text{ExpTime}[V_i, S_j]} \times 100\%;$$

where:

$\text{ActualTime}[V_i, S_j]$  = actual segment travel time for the vehicle  $V_i$  to travel over the roadway segment  $S_j$ .

21. (Currently Amended) The method of claim 18, wherein the starting speed of the vehicle  $V_i$  at the beginning of the roadway segment  $S_j$  is calculated by:  $\text{StartSpeed}[V_i, S_j]$  = average speed of the vehicle  $V_i$  over a prior roadway segment.

22. (Currently Amended) The method of claim 18, wherein the starting speed of the vehicle  $V_i$  at the beginning of the roadway segment  $S_j$  is calculated by:  $\text{StartSpeed}[V_i, S_j]$  = instantaneous speed of the vehicle  $V_i$  at the beginning of the roadway segment  $S_j$ .

23. (Cancelled)

1 24. (Previously Presented) The method of claim 1, further comprising the step of excluding a  
2 vehicle, which is overdue by more than a predetermined time cutoff threshold measured from a  
3 time that the vehicle is initially overdue, from being included in the number of vehicles  
4 potentially affected by the incident.

1 25. (Previously Presented) The method of claim 1, further comprising the step of excluding a  
2 vehicle, which has arrived early at the end of a roadway segment by more than a predetermined  
3 time cutoff threshold measured from a time that the vehicle is initially early, from being included  
4 in the number of vehicles potentially affected by the incident.

1 26. (Previously Presented) The method of claim 1, further comprising the step of suppressing  
2 the detection of the incident along the roadway when the number of vehicles exiting a segment  
3 of the roadway on an off-ramp over a predetermined interval of time exceeds a predetermined  
4 threshold.

1 27. (Previously Presented) A method for detecting an incident along a roadway, comprising the  
2 unordered steps of:

3       arranging a plurality of traffic probe readers at intervals along the roadway for reading a  
4 respective transponder disposed on each one of a plurality of vehicles;

5       correlating transponder readings from each one of the plurality of vehicles with expected  
6 readings associated with each one of the plurality of vehicles at more than one traffic probe  
7 reader to obtain at least one of a count of overdue vehicles or a count of early arriving vehicles;  
8 and

9       detecting the incident, which results in an interruption to the flow of traffic, in accordance  
10 with the correlating.

1 28. (Previously Presented) The method of claim 27, further comprising the step of writing time  
2 and location data into the transponder of each one of the plurality of vehicles.

1 29. (Previously Presented) The method of claim 27, further comprising the step of arranging a  
2 plurality of toll gateways at intervals along a roadway for reading a respective transponder ID

3 from a respective transponder disposed on each one of the plurality of vehicles and for  
4 determining the presence of vehicles not having a transponder.

1 30. (Previously Presented) An incident detection system comprising:

2 a traffic management center processor connected to a data network;  
3 a plurality of unique vehicle data readers connected to said data network such that  
4 uniquely identified data are read from each one of a plurality of vehicles;  
5 a correlation processor, wherein said uniquely identified data are correlated to obtain at  
6 least one of a count of overdue vehicles or a count of early arriving vehicles; and  
7 an incident detection processor coupled to the correlation processor and adapted to  
8 compare at least one of the count of overdue vehicles to a first sample threshold or the count of  
9 early arriving vehicles to a second sample threshold.

1 31. (Previously Presented) The system of claim 30 wherein said plurality of unique vehicle data  
2 readers comprise at least one of :

3 a plurality of traffic probe readers, each one of said plurality of traffic probe readers  
2 having a unique vehicle identification reader; or  
3 a plurality of toll gateways, each one of said plurality of toll gateways having a unique  
4 vehicle identification reader.

1 32. (Previously Presented) The system of claim 31 further comprising a plurality of roadside  
2 toll collection devices coupled to said plurality of toll gateways, coupled to said plurality of  
3 traffic probe readers, and coupled to said traffic management center, such that a volume of data  
4 transmitted to said traffic management center is reduced.

1 33. (Original) The system of claim 30 wherein said correlation processor is connected to said  
2 traffic management center processor.

1 34. (Previously Presented) The system of claim 30 wherein said correlation processor is  
2 connected to said plurality of unique vehicle data readers.

1 35. (Original) The system of claim 30 wherein said incident processor is connected to said  
2 traffic management center processor.

1 36. (Previously Presented) The system of claim 30 wherein said incident processor is connected  
2 to said plurality of unique vehicle data readers.

1 37. (Previously Presented) The apparatus of claim 30, wherein said incident detection processor  
2 is further adapted to determine an amount of time each one of the overdue vehicles is overdue  
3 past an expected arrival time, and to compare the amount of time each one of the overdue  
4 vehicles is overdue to a predetermined threshold.

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1 38. (Previously Presented) The apparatus of claim 30, wherein said incident detection processor  
2 is further adapted to determine the amount of time each one of the early arriving vehicles is early  
3 with respect to an expected arrival time, and to compare the amount of time each one of the early  
4 arriving vehicles is early to a predetermined threshold.